medical sciences, particularly in their bearing upon clinical medicine and human physiology. This point of view is most important and far too often neglected in our American schools of medicine, where the medical sciences and clinics are so thoroughly dissociated. The book should continue to be of general interest to the medical profession as it is of nearly equal value to medical students and to our practising physicians.

It is somewhat unfortunate that the publishing has been made so elaborate. If there were fewer colored illustrations and fewer plates the price of the book could probably have been markedly reduced without a corresponding reduction of its instructive value.

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Triassic Fishes from Spitzbergen. By Erik A:Son Stensiö. Upsala, 1921.

This is one of the most important paleontological memoirs which has appeared in recent years. It represents an attempt to distinguish fossil fishes as organisms, rather than as horizon markers. The geological aspects of the question are, however, thoroughly discussed.

Stensiö is a student of Professor C. Wiman of Upsala, whose contributions during the last few years have interested paleontologists in the fauna of ancient Spitzbergen. Wiman has sent or led expeditions into Spitzbergen since 1908, and on the basis of the material thus assembled the present writer Stensiö has based his account.

The quarto, representing Part I. of Stensiö's studies, consists of 307 pages of printed matter, 35 plates and 90 figures in the text. The press-work coming from Vienna is excellent. The plates represent photographic reproductions of the fossils, with Stensiö's interpretations of the anatomy lettered in white ink in the photographs. The results are especially pleasing and easy of reference.

Elasmobranchs, dipnoans, crossopterygians and three families of Actinopterygii constitute the fauna and Stensiö has described and interpreted his findings in a very excellent manner. Especially interesting are his accounts of the sensory canals of the head; the relationship of the crossopterygians and the tetrapods and the correlations of the primordial ossifications of the head of these primitive forms. It is a grateful relief to find taxonomy in the background. Nomenclature often absorbs more space than is needful.

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SPECIAL ARTICLES

INHIBITORY EFFECT OF DERMAL SECRETION OF THE SEA-URCHIN UPON THE FERTILIZABILITY OF THE EGG

In the early part of September of this year (1921), while working in the Marine Biological Laboratory at Woods Hole, Mass.,[1] I happened to find a striking fact that the eggs of *Arbacia punctulata* obtained through the genital pores, as most commonly practised,[2] did not develop at all, whereas those taken out from inside the shell developed normally. The results of a few but repeated experiments carried out with regard to this peculiar phenomenon may be given summarily as follows:

The eggs which escaped through the genital pores of opened sea-urchins, and were then transferred to clean sea-water in finger bowls, but subjected to no subsequent washing, were seen attracting spermatozoa but no fertilization occurred. These eggs were later washed repeatedly with clean sea-water at various intervals. If simply washed they never developed. But at a fresh insemination these washed eggs began to develop; thus, for example, the eggs washed and inseminated after standing for 50 hours in room temperature were found still capable of developing into normal and healthy

[1] My hearty thanks are due to Professor E. B. Wilson for the privilege of the use of a Columbia University table in the Marine Biological Laboratory, and to Professor F. R. Lillie, director, and other members of the staff of the said laboratory for every facility for my work. Further, to Professor E. G. Conklin, who has kindly criticized and corrected the manuscript, I express my sincere thanks.

[2] See F. R. Lillie, *Biol. Bull.*, XXVIII., 4, 1915, p. 231.

plutei. Of those which had stood for more than 57 hours, however, only a very few reached the four-cell stage, no further development taking place.

The eggs taken out from inside the shell, on the other hand, showed invariably a high fertilizability, even when much of the "perivisceral fluid" ("blood") had been mixed in water and no washing followed. After more than 28 hours' standing in room temperature, and without subsequent washing, they could be fertilized and they developed into plutei, while among those which had stood for more than 47 hours very few could segment and reach the gastrula stage.[3]

The substance, which inhibits the fertilization and which probably can, to some extent, thus prolong the life of the unfertilized egg, has been found to come from the surface of the body of the sea-urchin. This I may call "dermal secretion." If a sea-urchin is opened and inverted over a dry dish for a while some dull yellowish fluid collects in the dish. When the eggs taken out from inside the shell were inseminated *in* this "dermal secretion," no matter whether the latter had been obtained from male or female animals, fertilization was found inhibited in varying degrees according to the concentration of the fluid. The dermal secretion, when present in a 5 per cent. concentration in sea-water, was found sufficient to inhibit all the eggs from fertilization. In 2.5 per cent. solution about 10 per cent. of the eggs fertilized, and in 1 per cent. solution about 50 per cent. of the eggs developed. When present in less than 0.5 per cent. concentration practically every egg could be fertilized.

If, however, the eggs were treated with a strong solution of this substance *after* fertilization no injurious effect was found on the early development as late as the pluteous stage. The activity of the spermatozoa also does not seem to change in this fluid.

The dermal secretion thus obtained from *Arbacia* has some inhibitory action also on the eggs of the sand-dollar, *Echinarachnius parma,* though in a lower degree. In a 15 per cent. solution of this fluid in sea-water none of the sand-dollar eggs were found fertilized, in a 10 per cent. solution about 1 per cent. of the eggs developed, and in a 5 per cent. solution about 20 per cent. of the eggs developed.

Through the kindness of Dr. H. C. van der Heyde the substance in question was shown to contain uric acid. From lack of sufficient time I was unable to see if uric acid alone dissolved in sea-water would exhibit the same action upon the egg as the dermal secretion does.

The same substance could also be obtained in some other ways: for example, by placing an *intact* sea-urchin on a dish for a while, no matter which side down, after being washed with fresh water, or by irritating the animal with the sharp point of a glass needle instead of treating with fresh water. On the other hand, sea-water in which some scraped pieces of skin, tube-feet, spines, etc., had been soaked for some time showed very little inhibitory effect upon the fertilizability of the egg.

According to Lillie[4] the perivisceral fluid of *Arbacia inhibits* the fertilizability of the egg, whereas the dermal secretion *protects* the egg from the inhibitory action of the former. I have found that the perivisceral fluid had very weak inhibitory action upon the fertilizability of the egg; thus in a 50 per cent. solution of the same in sea-water about 5 per cent. of the eggs fertilized, and even in a 75 per cent. solution about 1 per cent. of the eggs could be fertilized. Although it may seem quite contrary to Lillie's conclusions, my results rather confirm his view that the inhibitory action of the perivisceral fluid increases during the period when sexual elements are ripe. Lillie's experiments were mostly made in July, when the gonads of *Arbacia* are quite active, while the breeding season comes nearly to an end early in September, when my material was obtained.

It is well known that among Echinoderms, especially Holothurians, there are several species in which the eggs are fertilized and develop inside the mother's body-cavity. In such cases it seems highly improbable that a

[3] As to the longevity of the unfertilized egg of *Arbacia* see A. J. Goldfarb, *Biol. Bull.*, XXXIV., 6, 1918, pp. 393–5; and E. N. Harvey, *Biol. Bull.*, XXVII., 5, 1914, p. 238.

[4] *Jour. Exper. Zool.*, XVI., 4, 1914, pp. 570–7.

strong inhibitory action of the perivisceral fluid upon fertilization should occur at the breeding season. As to the action of the dermal secretion there seems to be hardly any biological significance, since under natural conditions neither egg nor sperm encounters such a high concentration of the secretion as suffices to inhibit fertilization.

Having been engaged in other work, I could not carry out this series of experiments more fully and accurately. But, as I shall not have further opportunity of dealing with this Atlantic species, I have here ventured to communicate this incomplete note, simply with the hope that it may lead to further research on the seasonal changes in the effects of the "dermal secretion" and the "perivisceral fluid" of the sea-urchin upon the fertilizability of the egg.

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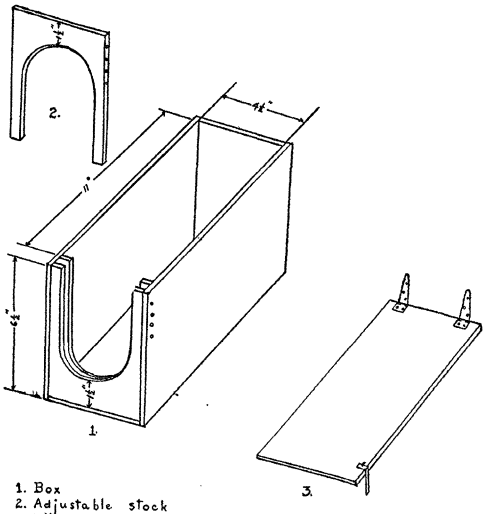
Simple Method of Bleeding Rabbits

The simplest method of obtaining rabbit's blood, when more than a few drops are necessary, is that of bleeding from the median artery of the ear. This vessel stands out prominently and is easy of entrance, if the animal is full grown. As much blood can be taken by this method as directly from the heart, and either a syringe may be used, or a cannula only, with a tube to receive the fluid.

The chief advantage of bleeding from this vessel is that small quantities of blood (3 c.c. to 5 c.c.) may be obtained at frequent intervals (daily, if necessary), each point of entry being successively nearer the base of the ear. Ten or more cubic centimeters may be obtained just as easily.

It is occasionally found that even when the needle seems to be safely within the artery, a good flow does not follow. This is sometimes caused by a plug of skin blocking the passage of the blood, but more often it will be found that there are two smaller arteries in place of the single larger one, with a consequently smaller flow in each. Animals which have the single vessel should for this reason be selected. In general, the larger the vessel, the greater is the ease of obtaining blood. A sharp needle is essential, because, due to the thickness and toughness of the arterial



Cage for Bleeding Rabbits

walls, a somewhat dull point will almost invariably pass around the vessel rather than into it. A small needle is best because of the smaller puncture it makes, and the consequently greater ease of stopping the blood after withdrawal. A 21- to 23-gauge needle has been found by the writer to be most satisfactory.

Little trouble is experienced in stopping the flow upon withdrawal of the cannula, usually no more than following withdrawal from a vein. Potassium alum will very quickly stop the bleeding where it will not do so naturally.

The marginal ear vein may also be used in the same way, though it is difficult to obtain more than a cubic centimeter or two therefrom on account of the lower pressure and decreased flow in the veins. The needle must, of course, in all cases be inserted opposite to the direction of the blood flow.

White rabbits, or rabbits with white ears, are much the most suitable sort for this work for obvious reasons. Injections into and bleedings from ear vessels are greatly facilitated by placing an electric light below the ear in such a position as to make the ear translucent. If alcohol is applied on a bit of ab-